

WHAT IS CLAIMED IS:

1. A computer-assisted method for selecting and directing the isolation of one or more biomolecules present in a two-dimensional array, comprising:
  - a purification step, wherein a plurality of biomolecules of interest are substantially isolated from a first biological sample;
  - a first separation step, wherein said biomolecules are separated according to a first physical or chemical property to form a one-dimensional array of biomolecules;
  - a second separation step, wherein said one-dimensional array of biomolecules is separated according to a second physical or chemical property to form said two-dimensional array;
  - imaging said two-dimensional array or a replica thereof to generate a computer-readable output comprising, for each of a plurality of biomolecules detected in said two-dimensional array, a pair of x,y coordinates and a signal value;
  - processing said output in at least one computer to select one or more of said detected biomolecules in accordance with previously ordained or operator-specified criteria; and optionally
  - generating machine-readable instructions that direct a robotic device to isolate at least one of said selected biomolecules from said two-dimensional array.
2. The method according to claim 1, further comprising:
  - isolating at least one of said selected biomolecules from said two-dimensional array by means of said robotic device in accordance with said machine-readable instructions.
3. The method according to claim 1, in which said biomolecules are proteins.
4. The method according to claim 1, in which said two-dimensional array is contained in a polyacrylamide gel.

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B17 The method according to claim 4, in which said biomolecules have been separated by isoelectric focusing, followed by electrophoresis in the presence of sodium dodecyl sulfate.

~~6. The method according to claim 4, in which said polyacrylamide gel is bonded to a generally planar solid support such that the gel has two-dimensional spatial stability, and the support is substantially non-interfering with respect to detection of a detectable label carried by the proteins.~~

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B17 The method according to claim 6, in which said polyacrylamide gel is covalently bonded to said solid support.

~~8. The method according to claim 6, in which said detectable label is a fluorescent label.~~

9. The method according to claim 6, in which said solid support is glass.

10. A computer assisted method for excising a region of a gel containing desired biomolecules from a gel, comprising:

- a) separating said desired biomolecules from undesired biomolecules in a 2-D electrophoresis method to yield a separation of biomolecules on said gel;
- b) scanning said gel to yield a digitized image of biomolecules in said gel;
- c) using data from said digitized image to position a cutter over said region of said gel containing said desired biomolecules wherein positioning of said cutter is computer controlled;
- d) moving said cutter into said gel to cut said region of said gel containing said desired biomolecules; and
- e) lifting said cutter to lift said region of said gel containing said desired biomolecules away from said gel.

11. The method of claim 10 wherein said biomolecules are selected from the group consisting of proteins, DNA and RNA.

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12. The method of claim 10 wherein said biomolecules are radioactively labeled or fluorescently labeled.
13. The method of claim 10 wherein said biomolecules are stained prior to scanning.
14. The method of claim 13 wherein said stain is selected from the group consisting of Coomassie Brilliant Blue, a silver stain, a fluorescent stain and a negative stain.
15. The method of claim 10 wherein said 2-D electrophoresis method comprises a step of isoelectric focusing.
16. The method of claim 10 wherein said 2-D electrophoresis method comprises a step of SDS polyacrylamide gel electrophoresis.
17. The method of claim 10 wherein said 2-D electrophoresis method comprises a step of immobilized pH gradient (IPG) isoelectric focusing.
18. The method of claim 15 wherein said isoelectric focusing is performed on a gel covalently bonded to a solid support.
19. The method of claim 18 wherein said solid support is plastic or glass.
20. The method of claim 17 wherein said IPG isoelectric focusing is performed on a gel covalently bonded to a solid support.
21. The method of claim 20 wherein said solid support is plastic or glass.
22. The method of claim 10 wherein said gel is placed onto a supporting plate prior to moving said cutter into said gel.
23. The method of claim 10 wherein said scanning is performed by a CCD digitizer.

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24. The method of claim 10 wherein said cutter is mounted on a movable, computer controlled X-Y frame.
25. The method of claim 24 wherein said cutter is suspended above and co-planar with said gel.
26. The method of claim 10 wherein more than one region of said gel is excised with each region being excised separately.
27. A computer assisted method for excising a region of a gel containing desired biomolecules from a gel, comprising:
- a) separating said desired biomolecules from undesired biomolecules in a 2-D electrophoresis method to yield a separation of biomolecules on said gel wherein said biomolecules are labeled to release radiation;
  - b) placing a film sensitive to said radiation in contact with or near said gel to expose said film and produce an exposed film;
  - c) developing said exposed film to produce a developed film;
  - d) scanning said developed film to yield a digitized image of biomolecules in said gel;
  - e) using data from said digitized image to position a cutter over said region of said gel containing said desired biomolecules wherein positioning of said cutter is computer controlled;
  - f) moving said cutter into said gel to cut said region of said gel containing said desired biomolecules; and
  - g) lifting said cutter to lift said region of said gel containing said desired biomolecules away from said gel.

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